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ABSTRACT

A general set of program generic control and documentation procedures has been developed to produce and maintain program documentation in standard Bell System format. The basic approach used is to document program generic *source* in basic units of *files*.

Tools, primarily *shell* command files and *nroff* macro definition files, have been created to:

1. Establish and administer a simply structured system of directories and files containing source code.
2. Produce Program Listing (PR) documentation in standard Bell System program documentation format.

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Bell Laboratories

**Subject: Program Generic Control and Documentation on
UNIX**

Case- 49170-110 -- File- 40952-1

date: May 17, 1976

from: G. C. Vogel

TM: 76-8234-13

MEMORANDUM FOR FILE

1. Introduction

The program generic control and documentation procedures described in this memorandum have been used by the UNIX Support Group (USG) to produce and maintain UNIX Program Generic documentation. The basic approach is to document program generic *source* in basic units of *files*. Examples illustrating each step of the process are given in the appendices.

Tools, primarily *shell* command files and *nroff* macro definition files, have been created to:

1. Establish and administer a simply structured system of directories and files containing source code,
2. Produce Program Listing (PR) documents in standard Bell System program documentation format.

This approach has been used by the USG to produce the PR documents contained in the first two issues of the UNIX Operating System Program Generic and is intended for general use by all minicomputer-based projects issuing standard program documentation.

2. Source File Organization

The program generic control procedures described here are designed to keep copies of all source files associated with a program generic issue and to interface easily with the PR document preparation function.

Only information relevant to a Program Generic issue is maintained. Source control information such as line changes between issues, who changes, etc. is not recorded. The primary features of this approach to program generic source control are:

1. Compatibility with the PR document preparation function,
2. Generality,
3. Simplicity.

Source files are organized in a UNIX file system hierarchy that parallels the hierarchy of the standard Bell System Program Documents as illustrated in Figure 1.

At the highest level in the documentation hierarchy is the Program Document (PG) Index that lists all of the documents associated with a program generic. A single PG-level directory occupies the corresponding position in the file system hierarchy.

One kind of document listed in the Program Document Index is the Program Listing (PR) document. The PR document is composed of an index and pident listings. The word 'pident' stands for *program identification*. In the file system hierarchy, PR-level directories correspond to PR Indexes, and files (containing source code) correspond to pident listings. There is a one-to-one correspondence between source files and pidents.

The analogous hierarchical levels are summarized as follows:

Documentation Hierarchy	File System Hierarchy
PG Index	PG-level directory
PR Indexes	PR-level directories
Pident Listings	Files

3. The Program Document Index

A Program Document Index (PG) provides a list of the program documents associated with the generic program and the issue of the documents that applies to each issue of the generic program. A sample PG document is shown in Appendix A.

4. Setting up the Program Generic Control System

The file system hierarchy is established by creating a new file system on a disk with the *mkfs* command. It is possible, but tedious, to create the file structure on an existing file system by making directories and copying files.

The structure of the newly created file system is illustrated in Figure 2. Note the three levels.

1. PG-level directory
2. PR-level directories
3. Source files (pidents)

5. Preparing Program Listing Documents

PR documents are specially formatted program listings. The procedure described here can be used to format any *text* (printable) file. No particular format is required for these text files.

5.1. Parameter Files

The PR format requires information seldom found in the program source files. This information is stored in parameter files (one parameter file per PR document) created with the UNIX text editor. Each parameter file contains the following required information:

1. Source File Names
2. PR Identification Number and Dash Number
3. PR title
4. PR Issue Number
5. Pident Names
6. Pident Issue Numbers
7. Pident Titles
8. Number of Pages in the Pident Listings

All of the information in the parameter file must be supplied manually except for the number of pages in the pident listings which is calculated and placed in the parameter file automatically with the special command *count*.

Appendix B describes the format and contents of the parameter files and shows a parameter file for one of the PR documents listed in the PG of Appendix A. The *count* command is also described in Appendix B.

5.2. Generating PR Documents

PR Indexes and pident listings are produced using the *nroff* text formatter and two *nroff* macro definition files, *prxmac* and *prmac*. *Prxmac* was developed to generate PR Indexes from the information contained in the parameter files. *Prmac* uses the information in the parameter files to create pident listings. Thus, once the parameter and source control files are established, a PR document can be generated with two simple commands, for example:

```
nroff prxmac paramfile > prindex
```

```
nroff prmac paramfile > prlistings
```

Appendix B, shows a sample PR document (index and pident listings) and explains how it was generated. The macro definition files, *prxmac* and *prmac* are also listed along with a description of how they work.

6. Reissuing the Program Generic

Reissuing the Program Generic requires a new Program Document Index, and new PR indexes and pident listings for all the pidents that have been changed. A reissue of the Program Document Index is shown in Appendix C.

6.1. Updating the Program Generic Control Files

Program Generic control directories and files must be updated before new issues of the PR documents are generated. A new issue is added to the file system in two steps:

1. The current issue is replicated (with a new name under a new PG-level directory),
2. The replicated copy is modified to create the new issue.

The result is a new PG-level directory with new PR-level directories containing all source files in the new issue of the Program Generic.

6.1.1. Update Example

In the example shown in Figures 3 and 4, PG-1C300 issue 1 exists in the program generic control file format. There are two PR-level directories, pr-1c300-01 and pr-1c301-01. Each of these contains two source files. The goal, in this example, is to add PG-1C300 issue 2 to the control file system. The resulting program generic control file system will contain both issue 1 (found under pg-1c300-01) and issue 2 (found under pg-1c300-02) of the Program Generic, PG-1C300.

The contents of each of these issues is summarized as follows:

PG-1C300	iss 1	PG-1C300	iss 2
PR-1C300-01	iss 1	PR-1C300-01	iss 2
BUFF01	iss 1	BUFF01	iss 1
CONF01	iss 1	INODE01	iss 1
PR-1C301-01	iss 1	PR-1C301-01	iss 2
ALLOC01	iss 1	ALLOC01	iss 1
CLOCK01	iss 1	CLOCK01	iss 2

6.1.2. Control File Replication

Replication, as shown in Figure 3, is accomplished using the special command *mkpgln* (make PG links). Appendix D describes the *mkpgln* command and illustrates its use.

The *mkpgln* command creates a new PG-level directory (pg-1c300-02)*, new PR-level directories, (pr-1c300-01 and pr-1c301-01 residing under the new PG-level directory and having the same names as in the previous issue) and then creates links from the newly created PR-level directories to the source files contained in the corresponding PR-level directories in the previous issue. The new directories and links created by the *mkpgln* command are indicated by the dotted lines in Figure 3.

The result of the replication step is the creation of a new PG-level directory, pg-1c300-02, whose contents are identical to that of PG-level directory pg-1c300-01. In most applications, contrary to this example, relatively few pidents will be changed between issues. Therefore, the ability to replicate the contents of the previous issue with a single command is an important feature.

6.1.3. Control File Modification

The modifications required to make the replicated issue, (PG-level directory pg-1c300-02), match PG-1C300 issue 2, are summarized as follows:

1. conf01.h-1 must be removed from pr-1c300-01
2. inode01.h-1 must be added to pr-1c300-01
3. clock01.c-1 must be replaced by clock01.c-2 in pr-1c301-01

Modification of the replicated issue is accomplished with three special commands: *ad*, *de*, and *up*. These commands allow pidents (files) to be added, deleted, or updated in the new issue. Notice that changes are made on the basis of pidents. Appendix E describes the commands *ad*, *de*, and *up*, and illustrates how they were used to make the modifications required in the current example.

The resulting Program Generic file system is shown in Figure 4. This file system contains the complete contents of PG-1C300 issue 1 under the directory pg-1c300-01, and the complete contents of PG-1C300 issue 2 under the directory pg-1c300-02.

It should be noted that file names in the source control file system are not identical to the corresponding pident names. For example, the pident ALLOC01 issue 1 source code resides in the file named alloc01.c-1. Mapping between file name and pident name is defined in the parameter files. This mapping allows the file name to contain information in addition to the pident name, such as, issue number.

Similarly, the directory names can be enhanced to include information related to the PG or PR documents. In the example shown in Figures 3 and 4, a two-digit suffix on the PG-level directory name was used to indicate the issue number of the PG. The two-digit suffix on the PR-level directory name indicates ownership as defined in a previous memorandum.

* In the example being discussed, dash numbers have been appended to file and directory names to provide additional information. In PG-level directory names and file names the dash numbers indicate issue number. In PR-level directory names the dash number indicates ownership as defined in "Referencing Standard UNIX Documentation," G. C. Vogel, August 23, 1974.

6.2. Updating Parameter Files

In addition to creating the new issue in the Program Generic control file system, the parameter files must be updated (new issue numbers and file names) with the UNIX text editor.



G. C. Vogel

MH-8234-GCV-unix

Atts.

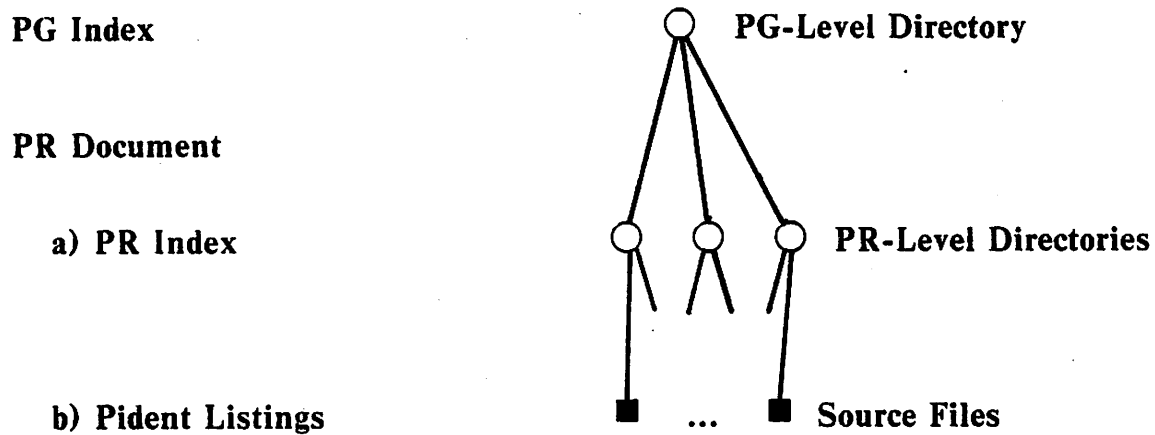
Figures 1 through 4

Appendixes A, B, C, D and E

References

- [1] J. F. Ossanna, *NROFF Users' Manual - Second Edition*, TM74-1271-14 (September 11, 1974).
- [2] G. C. Vogel, *Referencing Standard UNIX Documentation*, Memorandum for File (August 23, 1974).
- [3] *Program Documentation Standards*, Bell Laboratories (June 1972).
- [4] *UNIX Programmer's Manual*, PA-1C300-01 Issue 1, (January 1976).

FILE SYSTEM



The Bell System Standard Program Documentation hierarchy is compared with the file system hierarchy used for source control.

FILE SYSTEM CREATED WITH MKFS

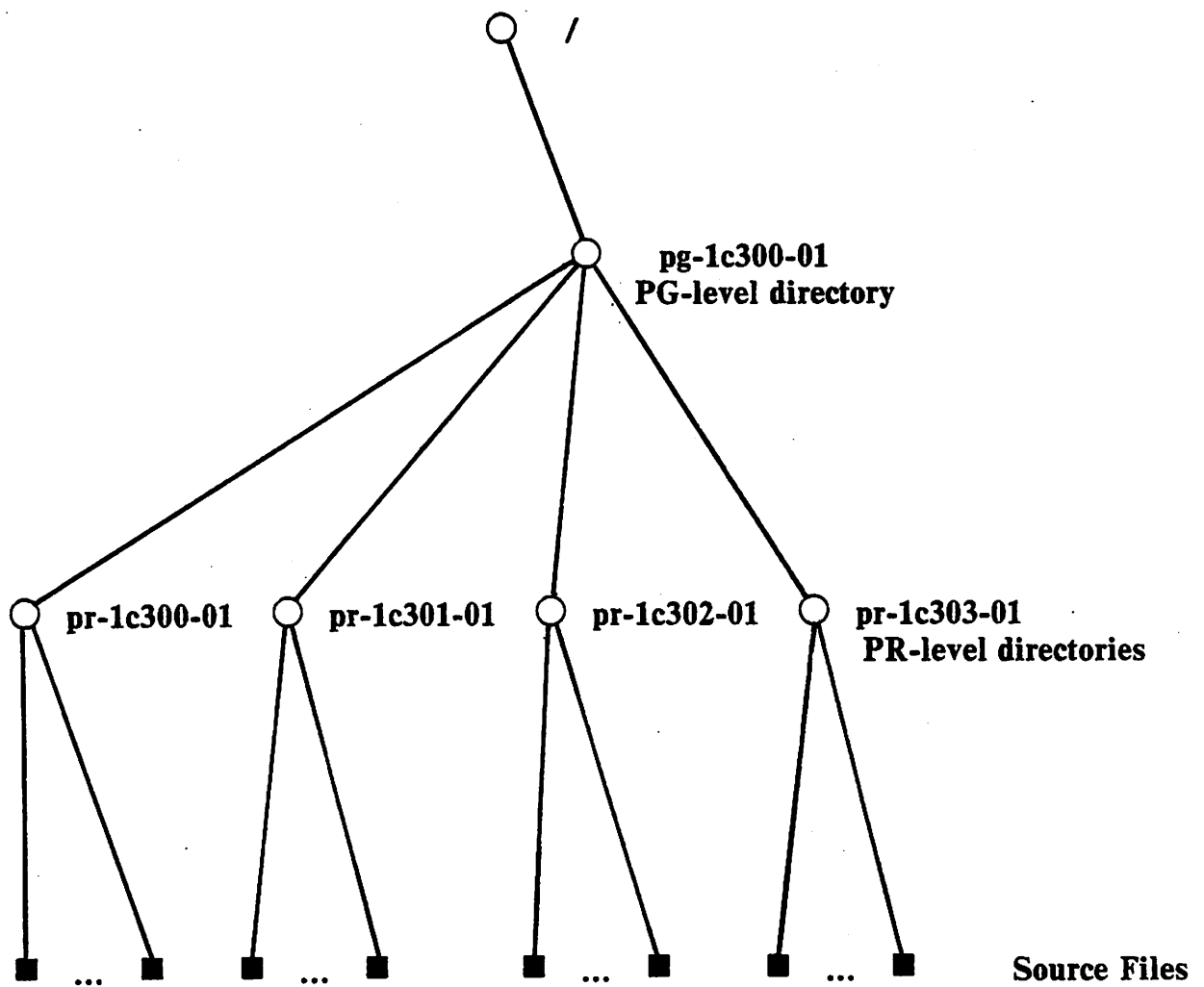


Figure 2

MKFS has been used to create a file system containing source files for the Program Generic, PG-1C300.

**REISSUING THE PROGRAM GENERIC:
REPLICATING THE SOURCE CONTROL STRUCTURE**

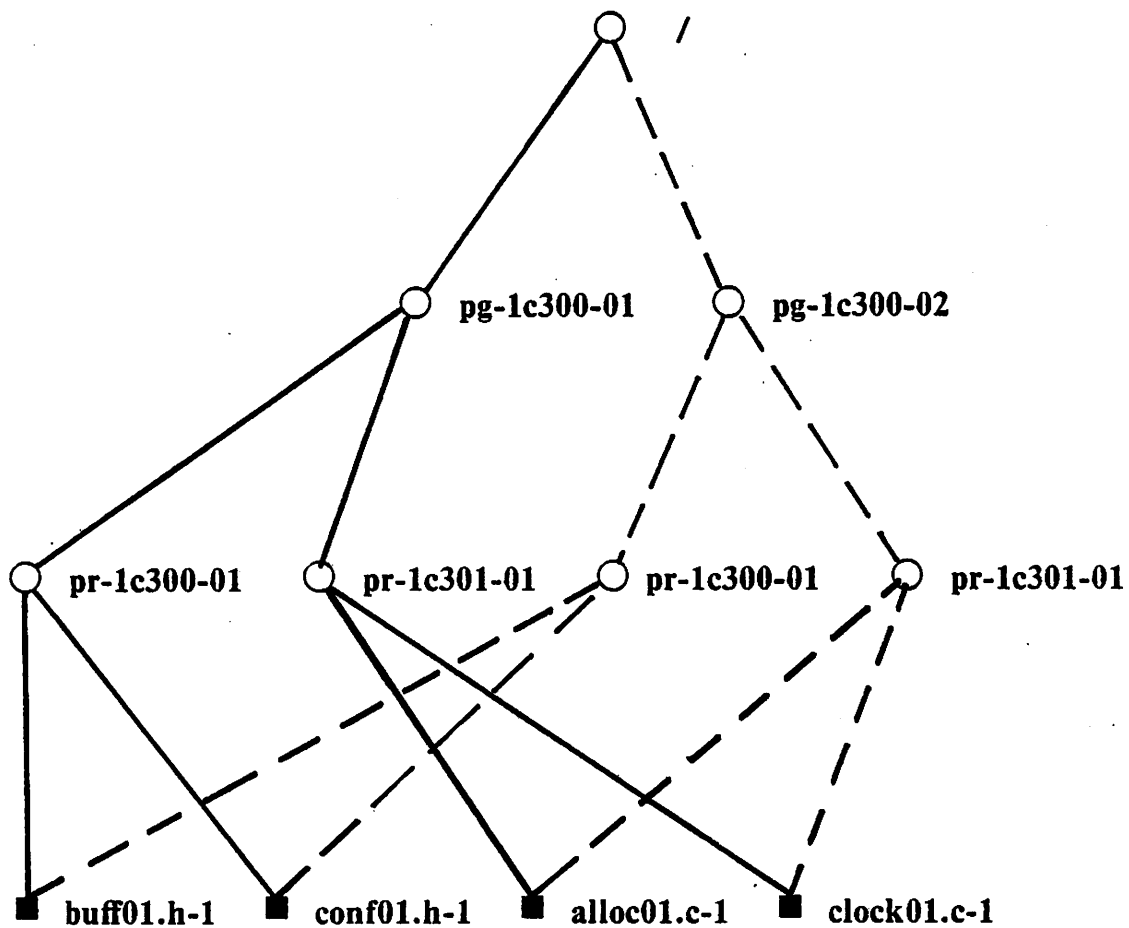


Figure 3

The source control file system is shown as it appears after the 'replication' step has been performed with the special command **mkpgln**. The 'replicated' directories and links are shown with dotted lines.

**REISSUING THE PROGRAM GENERIC:
MODIFYING THE REPLICATED FILE STRUCTURE**

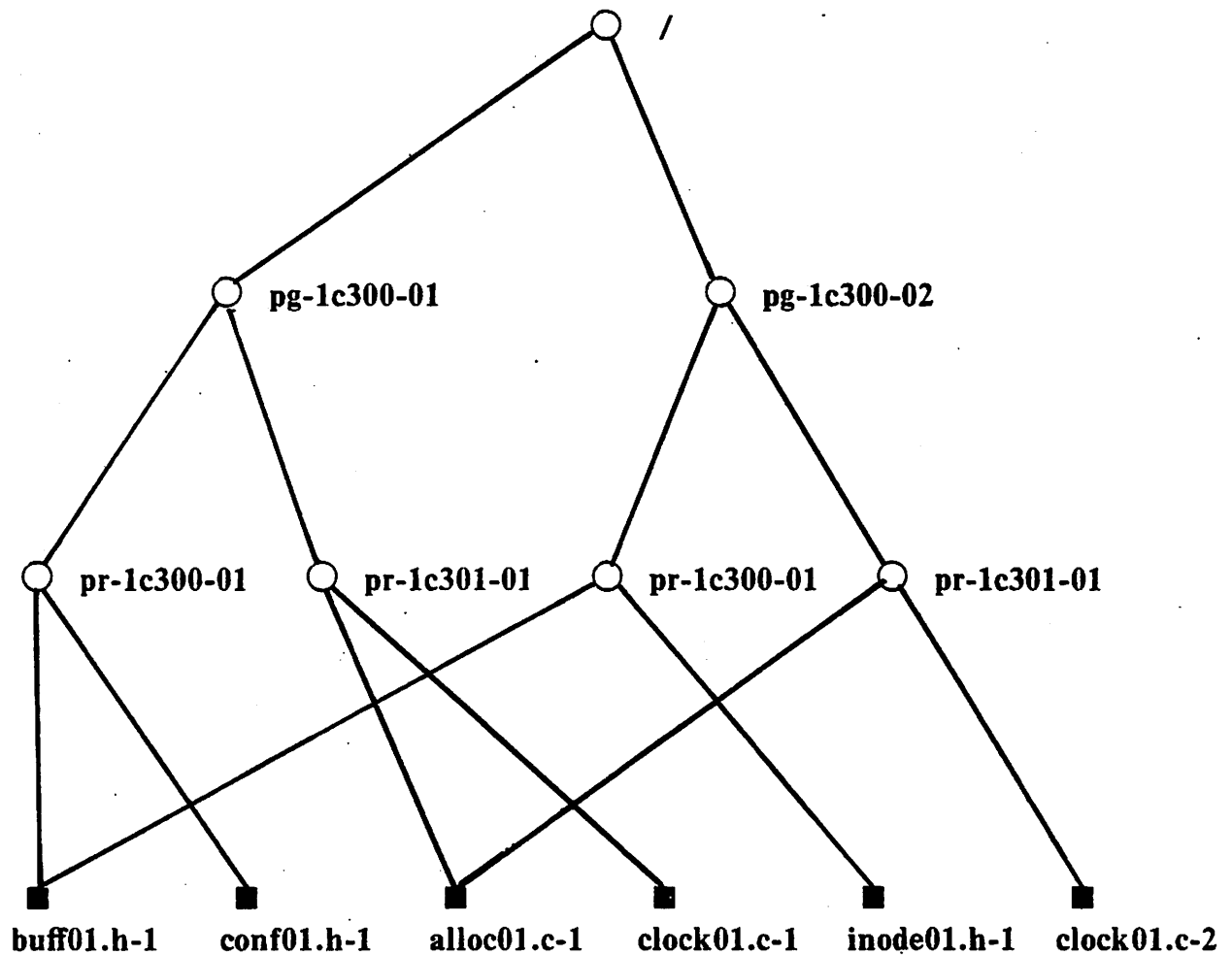


Figure 4

The directories and files under the PG-level directory, pg-1c300-02, have been modified to reflect the contents of PG-1C300 issue 2.

APPENDIX - A

GENERATION OF THE PROGRAM GENERIC INDEX

Contents

Program Generic Index Example Page A-2

The sample Program Generic Index was formatted using nroff.

```
nroff pgcover > pg
```

```
nroff pgxemacs pgbody >> pg
```

A-2

BELL TELEPHONE LABORATORIES, INCORPORATED

COMMON SYSTEMS
UNIX OPERATING SYSTEM
INDEX OF GENERIC PROGRAM DOCUMENTS

ISSUE 1
9/15/74

AT&T CO
SPCS

PG-1C300
2 PAGES

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DESCRIPTION

DOCUMENT
NUMBER

ISSUE

GENERIC PROGRAM

PG-1C300

1

PROGRAM LISTINGS

HEADER FILES

PR-1C300-01

1

OPERATING SYSTEM

PR-1C301-01

1

DEVICE DRIVERS SEC.1

PR-1C302-01

1

DEVICE DRIVERS SEC.2

PR-1C303-01

1

APPENDIX - B

CREATING PARAMETER FILES AND GENERATING PR DOCUMENTS

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Parameter file macro arguments	Page B-3
Parameter file example: param301	Page B-4
Description of <u>nroff</u> macro file prxmac .	Page B-5
Listing of <u>nroff</u> macro file prxmac	Page B-6
Sample PR Index	Page B-9
Description of <u>nroff</u> macro file prmac ..	Page B-10
Listing of <u>nroff</u> macro file prmac	Page B-11
Sample pident listing	Page B-13
Count command	Page B-16

The parameter file example, param301 was created as specified on page B-2 with the text editor. Using this file and the nroff macro file, prxmac, the sample PR Index was created by executing the command line:

```
nroff prxmac param301
```

The sample pident listing (along with the other pident listings in the sample PR document) was generated by the command line:

```
nroff prmac param301
```

PARAMETER FILE FORMAT

Parameter files are created with the UNIX text editor in the format listed on this page. Items in quotations must be filled in with the information indicated. If the item, such as "PR title" has embedded blanks, the item must be quoted.

Each parameter file has one occurrence of the first two lines and the last line. There is a pair of PI - PS macro calls for each pident imbedded in the PR document.

An '@' character is used as the nroff control character because it is not usually found as the first character of a line in source files. If an '@' character occurs as the first character of a line in a source file, which can be easily determined using grep, then another control character should be chosen.

```
@ds pg "full path name of the PG-level directory"
```

```
@PR "PR number" "dash number" "PR title" "PR issue number"
```

```
[ @PI "pident name" "file name" issue number "pident title"
  @PS "number of pages" "issue authorized" "issue authorized" ... ]
```

```
@E
```


PARAMETER FILE MACRO ARGUMENTS

PR Macro - Program Listing Information

PR Number A PR (Program Listing) designation. The dash-number suffix is not included.

Dash Number PR dash number used as a suffix.

PR Title The PR title as it is to appear on the PR Index. (32 character limit)

Issue Number The issue number of the PR document.

PI Macro - Pident Information

Pident Name Program identification name.

File Name Name of the file containing the pident named in argument one.

Issue Number Pident issue number.

Pident Title Title of the pident.

PS Macro - Pident Size and Issues Authorized

Number of Pages Number of pages in the pident listing. If the number of pages is unknown, insert a number which can be overwritten by the count command.

Issues Authorized A list of the issues authorized corresponding to the issues of the PR document.

E Macro - End of PR Group

General

1. All titles are translated to upper case before printing.
2. Dates are defined using strings in the macro definition files.
3. The file structure used for storing the source files must conform to the two-level directory structure as used for source control.

Apr 21 09:51 param301 Page 1

```
@ds pg /mntpg/pg-lc300-01
@PR "pr-lc301" "-01" "Operating system" "1"
@PI "alloc01" "alloc01.c-2" "1" "disk allocator"
@PS 6 1
@PI "clock01" "clock01.c-1" "1" "system clock"
@PS 4 1
@PI "fio01" "fio01.c-2" "1" "file I/O"
@PS 4 1
@PI "iget01" "iget01.c-1" "1" "i-node interface"
@PS 4 1
@PI "main01" "main01.c-2" "1" "main"
@PS 5 1
@PI "nami01" "nami01.c-1" "1" "file name string interpreter"
@PS 4 1
@PI "prf01" "prf01.c-2" "1" "print facility"
@PS 3 1
@PI "rdwri01" "rdwri01.c-1" "1" "read/write i-node"
@PS 4 1
@PI "sig01" "sig01.c-1" "1" "signal"
@PS 3 1
@PI "slp01" "slp01.c-2" "1" "process switching"
@PS 8 1
@PI "subr01" "subr01.c-2" "1" "system subroutines"
@PS 4 1
@PI "sys101" "sys101.c-1" "1" "system routines part 1"
@PS 8 1
@PI "sys201" "sys201.c-2" "1" "system routines part 2"
@PS 6 1
@PI "sys301" "sys301.c-2" "1" "system routines part 3"
@PS 4 1
@PI "sys401" "sys401.c-2" "1" "system routines part 4"
@PS 6 1
@PI "sysent01" "sysent01.c-1" "1" "table of system entry points"
@PS 2 1
@PI "text01" "text01.c-1" "1" "shared program"
@PS 3 1
@PI "trap01" "trap01.c-1" "1" "trap handler"
@PS 4 1
@E
```

prxmac - NROFF MACRO DEFINITION FILE

Prxmac is a nroff macro definition file for producing PR Indexes in standard Bell System Documentation format.

Strings

DA - Date to appear on PR Index
T1 - First line of title for PR Index
T2 - Second line of title for PR Index
TR - Top rule line
MR - Middle rule line
BR - Bottom rule line
NE - Null pident entry
PN - PR number (without suffix)
PU - PR suffix
PT - PR title
PE - PR document issue number
IN - Pident name
II - Pident issue number
IT - Pident title
IP - Pident pages
IA - Pident issues authorized

Macros

PR - Initialize strings with PR data and call for printing of first part of index.
D1 - Print first part of index.
PI - Initialize strings with pident data.
PS - Initialize strings with additional pident data.
DI - Make an entry in the PR Index Sheet for the current pident
E - Pad with null pident entries and call for text and title to be printed.
FI - Pad with null pident entries.
TX - Print text and title portion of the PR Index Sheet.

```
.cc @
@ds DA 10/15/75
@ds T1 COMMON SYSTEMS
@ds T2 UNIX OPERATING SYSTEM
@nf
@lt 119
@ll 119
@pl 68
@po 1
@tr aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuUvVwWxXyYzZ
@* TOP RULE
@ds TR {
```

```

}
@* MIDDLE RULE
```

```
@ds MR {
```

```

}
@* BOTTOM RULE
```

```
@ds BR {
```

```

}
@ds NE |>|>>>>|>|
```

```
@* PR-MACRO "PR NUMBER" "DASH NUMBER" "PR TITLE" "ISSUE"
```

```
@de PR
```

```
@ds PN \\$1
```

```
@ds PU \\$2
```

```
@ds PT \\$3
```

```
@if 5-\\$4 @ds PE 1>2>3>4>
```

```
@if 4-\\$4 @ds PE 1>2>3>>
```

```
@if 3-\\$4 @ds PE 1>2>>>
```

```
@if 2-\\$4 @ds PE 1>>>>
```

```
@ds PF \\$4
```

```
@dl
```

```
..
@* DO-THE-1ST-PART MACRO
```

```
@de D1
```

```
@ne 58
```

```
@ta 9 27 30 49 81 117
```

```
\*(TR
```

```
|>CONTENTS>|>ISSUES AUTHORIZED>|>TITLES>|
```

```
\*(MR
```

```
@ta 27 31 34 37 40 49 117
```

```
\*(NE
```

Apr 21 10:01 prxmac Page 2

```
| \\\*(PN\\*(PU INDEX>| \\\*(PE>|>|
| \\\*(PN PIDENT>|>>>>|>|
```

```
..
@* PIDENT-MACRO "PIDENT NAME" "FILE NAME" "ISSUE" "PIDENT TITLE"
```

```
@de PI
@ds IN \\\$1
@ds II \\\$3
@ds IT \\\$4
```

```
..
@ ADDITIONAL-PIDENT-MACRO "NUMBER OF PAGES" "ISSUE" "ISSUE" ...
```

```
@de PS
@ds IP \\\$1
@ds IA \\\$2>\\\$3>\\\$4>\\\$5>\\\$6
@DI
```

```
..
@* DO-A-PIDENT-ENTRY MACRO
```

```
@de DI
| \\\*(IN (\\*(IP PAGES)>| \\\*(IA>| \\\*(IT>|
```

```
..
@* END NACRO
```

```
@de E
@FI
@TX
```

```
..
@* PADDING MACRO
```

```
@de FI.
\\*(NE
@if 35-\\n(nl @FI.
```

```
..
@* TEXT-AND-FINISH MACRO
```

```
@de TX
@ta 22 117
```

```
\\*(MR
|>THE CONTENT OF THIS MATERIAL IS PROPRIETARY AND CONSTITUTES A TRADE S\
ECRET.>|
|>IT IS FURNISHED PURSUANT TO WRITTEN AGREEMENTS OR INSTRUCTIONS LIMITI\
NG THE>|
|>EXTENT OF DISCLOSURE. ITS FURTHER DISCLOSURE WITHOUT THE WRITTEN PERM\
SSION>|
|>OF WESTERN ELECTRIC COMPANY, INCORPORATED, IS PROHIBITED.>|
```

```
\\*(MR
@ta 28 67 103 117
|>INDEX NOTES>|>|>|
@ta 33 67 103 117
```

```
|
|
|
|>|>|
```

```
1. WHEN CHANGES ARE MADE IN>3. ISSUE NUMBERS WILL BE ASSIGNED>| \\\*(T1\
>| ISSUE \\\*(PF>|
```

```
| THIS DOCUMENT ONLY THOSE> CONSECUTIVELY TO EACH PIDENT.>|>|>|
| PIDENTS AFFECTED WILL BE>>| \\\*(T2>| \\\*(DA>|
| REISSUED.>4. PIDENTS THAT ARE NOT CHANGED>|>|>|
|> WILL RETAIN THEIR EXISTING>| \\\*(PT>|
```

```
2. THIS INDEX WILL BE REISSUED> ISSUE NUMBER.>|>|>|
| AND BROUGHT UP TO DATE EACH>>|>| AT&T CO.>|
```

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| TIME ANY PIDENT IS CHANGED>5. THE LAST ISSUE NUMBER OF THIS>|>| SPCS\
 >|
 | OR A NEW PIDENT IS ADDED.> INDEX IS RECOGNIZED AS THE>|>|_____\

|> LATEST ISSUE NUMBER OF THE>|>|>|
 |> DOCUMENT AS A WHOLE.>|>|>|

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 @ce
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INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DOCUMENT ONLY THOSE PIDENTS AFFECTED WILL BE REISSUED.
2. THIS INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY PIDENT IS CHANGED OR A NEW PIDENT IS ADDED.
3. ISSUE NUMBERS WILL BE ASSIGNED CONSECUTIVELY TO EACH PIDENT.
4. PIDENTS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THIS INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DOCUMENT AS A WHOLE.

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COMMON SYSTEMS

UNIX OPERATING SYSTEM

OPERATING SYSTEM

ISSUE 1

10/15/75

AT&T
SPCS
CO.

PR-1C301-01

prmac - MACRO DEFINITION FILE

PRMAC is a nroff macro definition file used to generate program listings in standard Bell System Program Documentation format. In addition to making use of the standard nroff mechanisms the .eo (escape off) command is used. This new command was written by J. F. Ossanna to solve the problem of having character strings in the source file misinterpreted as escape sequences. The .eo command eliminates the escape character. To reinstate the escape character the .ec command is used.

Strings

da - Date to be printed on the listings
pr - PR designation including the suffix
sl - Complete pident file path name
F1 - First line of footer
F2 - Second line of footer
F3 - Third line of footer
H1 - First line of header
H2 - Second line of header

Macros

PR - Turn the escape character ON and initialize PR related strings.
PI - Turn the escape character ON, initialize pident related strings, and define the macros SO, HD and FT.
SO - Switch input to the pident source file.
HD - Print header, turn escape character OFF.
FT - Turn escape character ON and print footer.

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```

.cc @
@pl 59
@ll 100
@lt 100
@po 10
@in 15
@**      DATE
@ds da 1/30/76
@**      SECOND LINE OF FOOTER
@ds F2 @tl 'SEE TRADE SECRET RESTRICTIVE NOTICE ON INDEX PAGE'
@nr FG 1
@**      PR-MACRO "PR NUMBER" "PR TITLE"
@de PR
@ec
@ds pr \\$1\\$2
@ds F1 @tl '\\$3'\\$1'
..
@**      PIDENT-MACRO "NAME" "FILE" "ISSUE NUM." "TITLE"
@de PI
@ec
@if !\\n(FG @pn 1
@ds H1 @tl '\\$4 \\$5 \\ 6 \\$7 \\$8 \\$9'\\*(da'
@ds F3 @tl '\\$1 ISSUE \\$3 PAGE %'
@ds H2 @tl '\\$2'
@**      SOURCE FILE PATHNAME
@ds S1 @so \\*(pg/\\*(pr/\\$2
@de SO
\\*(S1
\\..
@**      HEADER
@de HD
@tr aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuUvVwWxXyYzZ
\\*(H1
@tr aabbccddeeffgghhiijjkkllmmnnnooppqgrssttuuvvwxyz
\\*(H2
'sp 2
@eo
\\..
@**      PUT HEADER ON FIRST PAGE
@if !\\n(FG 'bp
@if \\n(FG @HD
@nr FG 0
@**
@ec
@**      FOOTER
@de FT
@ec
'sp 2
@tr aAbBcCdDeEfFgGhHiIjJkKlLmMnNoOpPqQrRsStTuUvVwWxXyYzZ
\\*(F1
\\*(F2
\\*(F3
@tr aabbccddeeffgghhiijjkkllmmnnnooppqgrssttuuvvwxyz
'bp
\\..
@eo

```

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@** TRAPS

@wh 0 HD

@wh -8 FT

@SO

..
@nf

```

/**
 *
 */
#include "x-./head/seg.h"
#define KL      0177560

struct {
    int      rsr;
    int      rbr;
    int      xsr;
    int      xbr;
    int      csw;
};

char      *panicstr;
int      kisa6;

printf(fmt,x1,x2,x3,x4,x5,x6,x7,x8,x9,xa,xb,xc)
char fmt[];
{
    register char *s;
    register *adx, c;

    adx = &x1;

loop:   while((c = *fmt++) != '\0') {
        if(c == '\0')
            putchar(c);
        switch(c = *fmt++) {
            case "d":
                if(*adx < 0) {
                    putchar("-");
                    *adx = -*adx;
                }
            case "l":
            case "o":
                printn(*adx, c=="o"? 8: 10);
                break;
            case "c":
                putchar(*adx);
        }
    }
}

```

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```

        break;

    case "s":
        s = #adx;
        while(c = #s++)
            putchar(c);
    }
    adx++;
    goto loop;
}

printn(n, b)
{
    register a;

    if(a = ldiv(n, b))
        printn(a, b);
    putchar(lrem(n, b) + "0");
}

putchar(c)
{
    register rc, s;

    rc = c;
    if(KL->csw == 0)
        return;
    while((KL->xsr&0200) == 0);
    if(rc == 0)
        return;
    s = KL->xsr;
    KL->xsr = 0;
    KL->xbr = rc;
    if(rc == '\n') {
        putchar("\r");
        putchar(0177);
        putchar(0177);
    }
    putchar(0);
    KL->xsr = s;
}

panic(s)
char *s;
{
    panicstr = s;
    kisa6 = #ka6;
    update();
}

```

PRINT FACILITY

B-15

1/30/76
prf01.c-2

```
printf("panic: %s\n", s);  
for(;;) idle();
```

```
}
```

OPERATING SYSTEM

SEE TRADE SECRET RESTRICTIVE NOTICE ON INDEX PAGE

PRF01

ISSUE 2

PAGE 3

PR-1C301

COUNT

COUNT

NAME

count - calculate the number of pages in a pident listing

SYNOPSIS

count prnumber ...

DESCRIPTION

Count examines files in the generic control file structure under the PR-level directory indicated by 'prnumber'. The number of pages is calculated for each pident and inserted in the corresponding parameter file.

APPENDIX - C

REISSUING THE PROGRAM GENERIC INDEX

Contents

Program Generic Index Issue 2 Page C-2

The second issue of the Program Generic Index was generated with nroff by executing the command:

```
nroff pgcover2 > pg2
```

```
nroff pgxemacs pgbody2 >> pg2
```

where pgcover2 is created by modifying the previous Program Generic Index cover, pgcover, with the text editor.

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BELL TELEPHONE LABORATORIES, INCORPORATED

COMMON SYSTEMS
UNIX OPERATING SYSTEM
INDEX OF GENERIC PROGRAM DOCUMENTS

ISSUE 2
1/30/76

AT&T CO
SPCS

PG-1C300
2 PAGES

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DESCRIPTION	C-3 DOCUMENT NUMBER	ISSUE
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PROGRAM LISTINGS		
HEADER FILES	PR-1C300-01	1 2
OPERATING SYSTEM	PR-1C301-01	1 1
DEVICE DRIVERS SEC.1	PR-1C302-01	1 2
DEVICE DRIVERS SEC.2	PR-1C303-01	1 1

APPENDIX - D

MKPGLN COMMAND

Name

mkpgln - replicate generic file system structure with links to old files

Synopsis

mkpgln olgPGdir newPGdir

(use full path names for the old and new PG-level directory names)

Description

Mkpgln is used to establish the base for creating reissues of a Program Generic. The command does three things:

1. Create new PG-level directory.
2. Replicate PR-level directories in the new PG-level directory.
3. Make links from source files to the new PR-level directories.

APPENDIX - E

COMMANDS FOR MODIFYING GENERIC CONTROL FILES

Add a New File - ad

Synopsis

ad PRnumber genericname file

Description

Ad copies 'file' to the file 'genericname' in the PR-level directory 'PRname'.

Delete a File - de

Synopsis

de PRnumber genericname

Description

De removes the file 'genericname' from the PR-level directory specified by the number 'PRnumber'.

Update a File - up

Synopsis

up PRnumber oldgenericname newgenericname file

Description

Up removes the file 'oldgenericname' from the PR-level directory 'PRnumber' and then copies 'file' to the file 'newgeneric name'.